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TECHNICAL INFORMATION SERIES

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Summary

This technical information series (TIS) outlines a procedure for developing instructions and training materials for control panel operation and indicator and display interpretation. The method is particularly advantageous when the operator has to observe and respond to large amounts of data and manipulate many controls. Its attributes are:

1. Provides the means of integrating the instructions for the use of all of the controls, indicators, and display elements in large systems.
2. Organizes the information into formats that enable the user to quickly find the instructions pertinent to the immediate task.
3. Facilitates allocating the preparation of large numbers of instructions to several people.
4. Facilitates incremental development of instructions.
5. Provides direct output of reproducible copy.
6. Ensures complete coverage.
7. Reduces development time.
8. Reduces composition time.
9. Reduces change and update costs over 90%.

The process is described in this TIS as it is applied to the preparation of information for the tactical towed array sonar (TACTAS) System Operator's Manual. However, it can be applied with slight modification to systems having similarly complex man-machine interfaces.

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Data input, storage, processing, and output are performed by the time-share subsystem (TSS) of the Honeywell 520 Data Processing System (level 66).

Figure 1 depicts the process. Physical data including location, identification nomenclature, and possible states of each item of interest are entered incrementally as they are developed into working files (TCD-A1) (see Exhibit A). The data for each item is stored as a separate line-numbered record.

The entry media can be punched cards, remote terminal, or Diablo 1650 composer. In order to minimize keyboarding time the data is not formatted, however, the data must be entered in the correct order. The beginning of each data field is delimited by a comma. The unformatted working files (TCD-A1) are formatted and concatenated into file TCD-A (see Exhibit B) by the timeshare command:

CONV TCD-A; TCD-A1 = TCD-A: TAB (, , t, t+1, t+2, t+n), RESE (001, 1)

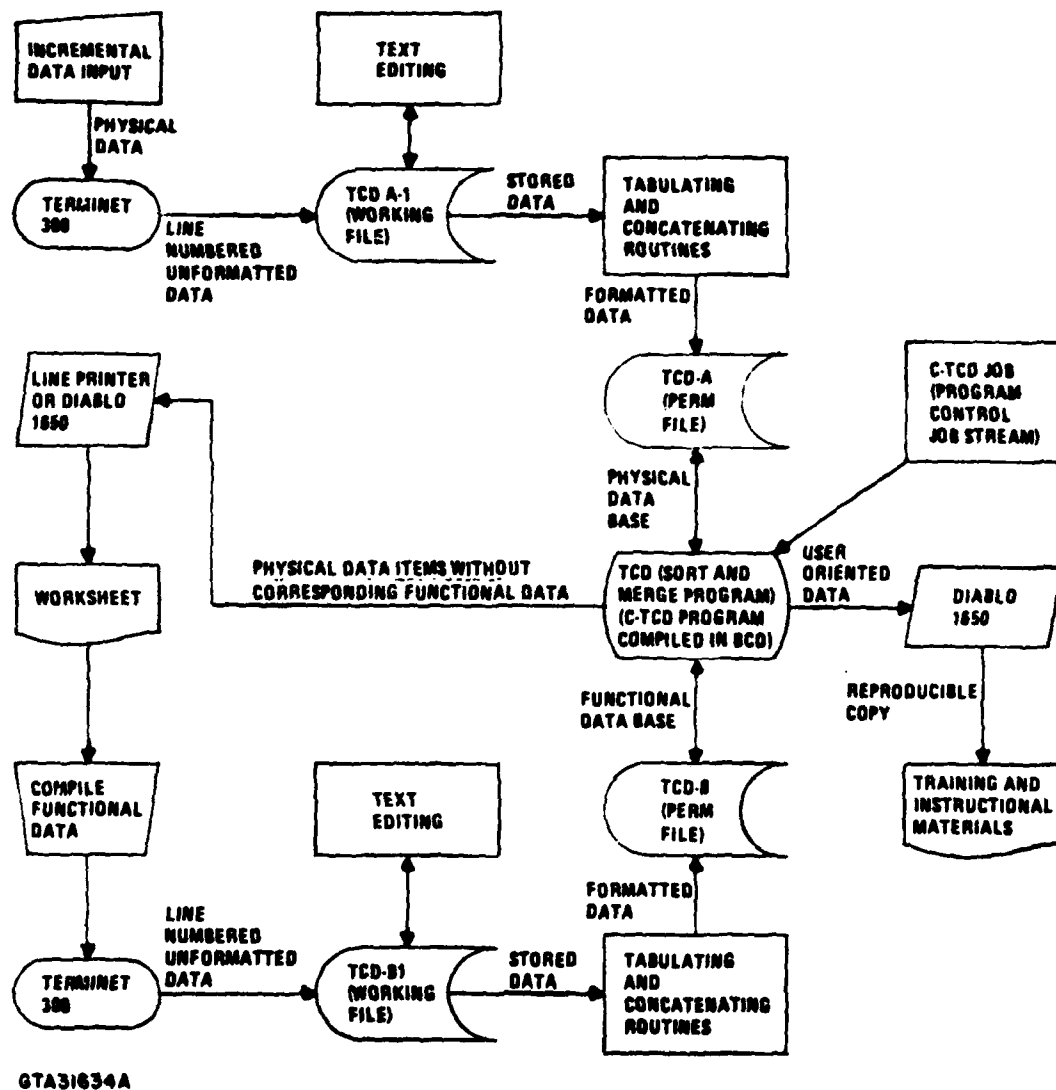


Figure 1. TACTAS Control and Display (TCD) User Data Development Process

1 ,SCP,REQ DPS NORM,WHITE
 2 ,SCP,DPS FAULT,GREEN
 3 ,SCP,DPS FAULT,RED
 4 ,SCP,DPS FAULT,DARK
 5 ,SCP,DPS NORM IN,WHITE
 6 ,SCP,DPS NORM IN,DARK
 7 ,SCP,DPS ALT IN,WHITE
 8 ,SCP,DPS ALT IN,DARK
 9 ,SCP,DPS NORM,WHITE
 10 ,SCP,REQ DPS NORM,DARK
 11 ,SCP,REQ DPS ALT,WHITE
 12 ,SCP,REQ DPS ALT,DARK
 13 ,SCP,REQ DPS NORM/REQ DPS ALT
 14 ,SCP,DPS RESTART,WHITE
 15 ,SCP,DPS RESTART,DARK
 16 ,SCP,DPS RESTART
 17 ,SCP,CSL GP POWER APPLIED,GREEN
 18 ,SCP,CSL GP POWER APPLIED,YELLOW
 19 ,SCP,CSL GP POWER APPLIED,DARK
 20 ,SCP,CSL GP ON,WHITE

Exhibit A. TCD-A1 Unformatted Physical Data Working File

*LIST TCD-A

001	SCP REQ DPS NORM	WHITE
002	SCP DPS FAULT	GREEN
003	SCP DPS FAULT	RED
004	SCP DPS FAULT	DARK
005	SCP DPS NORM IN	WHITE
006	SCP DPS NORM IN	DARK
007	SCP DPS ALT IN	WHITE
008		

Exhibit B. TCD-A Formatted Physical Data Perm File

The t-values specify the tab settings for the data fields in file TCD-A delimited by the commas in the unformatted file TCD-A1. The commas are automatically deleted in the process.

The time-share program TCD (see Exhibit C) is compiled into binary coded decimal (BCD) and stored in file TCD-C which is run under the control of jobstream file C-TCD JOB (see Exhibit D) when time-share command JRN C-TCD JOB is entered. The initial output of the program are worksheets which indicate the functional information required to complete the instructions and training materials (see Exhibit E). When the worksheet is complete (see Exhibit F) the data is entered into working file TCD-B1 in the same unformatted records as described above for file TCD-A1 (see Exhibit G). The line number used must match those in TCD-A. Working file TCD-B1 is formatted and concatenated into TCD-B (see Exhibit H) by the command:

CONV TCD-B; TCD-B1 = TCD-B: TAB (,,t,t₁,t₂,t₃,t₄) . RESE (001,1)

The physical data on TCD-A is correlated and merged with the functional data on file TCD-B (see Exhibit I) by program TCD. The merged data is sorted by field priorities to provide the user with the ability to locate the information pertinent to the task. There are two types of sorts: the first based upon functional parameters: action, function, range; the second by physical parameters: units, assembly, and item. Both sorts are printed out in reproducible copy format by a Diablo 1650 terminal.

*LIST TCD

```

10* FILE PROVIDES A JOBSTREAM TO MERGE & PRINT TCD DATA FILE
20 CHARACTER*80 LNA*3,LNB*3,RECA,RECB,LINE*132,DASH *1
30*FC 10 = DATA FILE A
40*FC 20 = DATA FILE B
50 CALL ATTACH (10,"TCD-A;",1,0,1,)
60 CALL ATTACH (20,"TCD-B;",1,0,1,)
70 LNCNT = 99
80 READ (20,900,END=10) LNB,RECB
90 900 FORMAT (A3,1X,A30)
100 10 READ (10,900,END=20) LNA,RECA
110 ENCODE (LINE,905) LNA,RECA
120 DASH = "-"
130 905 FORMAT (A3,1X,A56,"["",10X,""]["",22X,""]["",18X,""]["",
140 810X,""]")
150 IF (LNA.NE.LNB) GOTO 30
160 ENCODE (LINE,910) RECB
170 910 FORMAT (T61,A72)
180 DASH = " "
190 READ (20,900,END=30) LNB,RECB
200 30 IF (LNCNT.LT.25) GOTO 40
210 LNCNT = 0
220 WRITE (6,915)
230 915 FORMAT (2H1,"LNO UNIT DISP/CNT/IND",
240 & T32,"PG/PS/ST",T50,"ITEM",
250 & T65,"ACTION",T75,"PARAMETER/FUNCTION",T99,
260 & "RANGE/LIMITS",T119,"REFERENCE",//)
270 40 WRITE (6,920) LINE, (DASH, K=1,72)
280 920 FORMAT (2X,A123,/T61,/2A1)
290 LNCNT = LNCNT + 1
300 GOTO 10
310 20 STOP
320 END

```

Exhibit C. TCD,Merge/Sort/Output Program

*LIST C-TCD JOB

```

10$SNORM,ROUT(H1)
20$IDENT:278573-462-2993,SAS
30$OPTION:FORTRAN,NOMAP
40$USE:.GTLIT
50$SELECT:TTM/C-TCD
60$EXECUTE
70$ENDJOB

```

Exhibit D. C-TCD JOB, Control Jobstream

IND UNIT	DISP/CONT/IND	PARM/PHS/STAT	ITEM	ACTION	PARAMS T, P, F, UN, T, UN	RANGE/UNIT	REL. P, MCR
76	SCP	MASS MEMORY READY	YELLOW				
77	SCP	SFS POWER APPLIED	GREEN				
78	SCP	SFS POWER APPLIED	YELLOW				
79	SCP	SFS POWER APPLIED	DATA				
80	SCP	SFS ON	WHITE				
81	SCP	SFS ON	DATA				
82	SCP	SFS OFF	WHITE				
83	SCP	SFS OFF	DATA				
84	SCP	SFS ON/SFS OFF					
85	SCP	COOLANT FLOW	DATA				
86	SCP	COOLANT FLOW	GREEN				
87	SCP	COOLANT FLOW	RED				
88	SCP	ALARM CANCEL	WHITE				
89	SCP	ALARM CANCEL	DATA				
90	SCP	ALARM CANCEL					
91	SCP	APS POWER APPLIED	GREEN				
92	SCP	APS POWER APPLIED	YELLOW				
93	SCP	APS POWER APPLIED	DATA				
94	SCP	APS ON	WHITE				
95	SCP	APS ON	DATA				
96	SCP	APS OFF	WHITE				
97	SCP	APS OFF	DATA				
98	SCP	APS ON/APS OFF					
99	SCP	CABINET OVERTEMP	GREEN				
100	SCP	CABINET OVERTEMP	RED				

Exhibit E. Sample Worksheet

IND UNIT	RISP/CONT/IND	PAGE/POS/STAT	ITEM	ACTION	PARAMETER/FUNCTION	RANGE/LIMITS	REMARKS
26	SCP	MASS MEMORY READY	YELLOW	1 OBSERVE	11 UNIT 18 STATUS	11 0000-0000 NOT READY	11
27	SCP	SES POWER APPLIED	GREEN	1 OBSERVE	11 SES POWER STATUS	11 ENABLED	11
28	SCP	SES POWER APPLIED	YELLOW	1 OBSERVE	11 SES POWER STATUS	11 NOT USED	11
29	QCP	SES POWER APPLIED	DARK	1 OBSERVE	11 SES POWER STATUS	11 OFF	11
30	SCP	SES ON	WHITE	1 OBSERVE	11 SES PWR CONTROL SIG STATUS	11 ENABLED ON	11
31	QCP	SES ON	DARK	1 OBSERVE	11 SES PWR CONTROL SIG STATUS	11 OFF	11
32	QCP	SES OFF	WHITE	1 OBSERVE	11 SES PWR CONTROL SIG STATUS	11 NOT USED	11
33	QCP	SES OFF	DARK	1 OBSERVE	11 SES PWR CONTROL SIG STATUS	11 NO SIGNIFICANCE	11
34	SCP	SFS ON/SES OFF		1 TURN ON/OFF	11 SES PWR CONTROL SIGNAL	11 SIGNAL ENABLED/OFF	11
35	QCP	COOLANT FLOW	DARK	1 OBSERVE	11 COOLANT FLOW RATE	11 NO FUNCTION	11
36	QCP	COOLANT FLOW	GREEN	1 OBSERVE	11 COOLANT FLOW RATE	11 NORMAL	11
37	QCP	COOLANT FLOW	RED	1 OBSERVE	11 COOLANT FLOW RATE	11 BELOW NORMAL	11
38	QCP	ALARM CANCEL	WHITE	1 OBSERVE	11 ALARM RESET	11 NO SIGNIFICANCE	11
39	QCP	ALARM CANCEL	DARK	1 OBSERVE	11 ALARM RESET	11 NO SIGNIFICANCE	11
40	QCP	ALARM CANCEL		1 TURN OFF	11 ALARM RESET	11 RESETS AUDIBLE ALARM	11
41	QCP	APS POWER APPLIED	GREEN	1 OBSERVE	11 APS POWER STATUS	11 ENABLED	11
42	SCP	APS POWER APPLIED	YELLOW	1 OBSERVE	11 APS POWER STATUS	11 OFF	11
43	QCP	APS POWER APPLIED	DARK	1 OBSERVE	11 APS POWER STATUS	11 SES PWR CTRL SIG OFF	11
44	SCP	APS ON	WHITE	1 OBSERVE	11 APS PWR CTRL SIG STATUS	11 ENABLED ON	11
45	SCP	APS ON	DARK	1 OBSERVE	11 APS PWR CTRL SIG STATUS	11 OFF	11
46	SCP	APS OFF	WHITE	1 OBSERVE	11 APS PWR CTRL SIG STATUS	11 OFF SES POWER ON	11
47	SCP	APS OFF	DARK	1 OBSERVE	11 APS PWR CTRL SIG STATUS	11 ENABLED IF ON WHITE	11
48	QCP	APS UN/APS OFF		1 TURN ON/OFF	11 APS POWER CONTROL SIGNAL	11 ENABLED/OFF	11
49	QCP	CABINET OVERTEMP	GREEN	1 OBSERVE	11 SES CABINET TEMP LIMITS	11 NORMAL	11
50	QCP	CABINET OVERTEMP	RED	1 OBSERVE	11 SES CABINET TEMP LIMITS	11 OUT OF TEMP	11

Exhibit F. Sample Completed Worksheet

026 ,OBSERVE,UNIT 18 STATUS,POWER ON & NOT READY
 027 ,OBSERVE,SES POWER STATUS,ENABLED
 028 ,OBSERVE,SES POWER STATUS,NOT USED
 029 ,OBSERVE,SES POWER STATUS,OFF
 030 ,OBSERVE,SES PWR CONTROL SIG STATUS,ENABLE ON
 031 ,OBSERVE,SES PWR CONTROL SIG STATUS,OFF
 032 ,OBSERVE,SES PWR CONTROL SIG STATUS,NOT USED
 033 ,OBSERVE,SES

Exhibit G. TCD-B1 Unformatted Functional Data Working File

*LIST TCD-B

026	OBSERVE	UNIT 18 STATUS	PWR ON & NOT READY
027	OBSERVE	SES POWER STATUS	ENABLED
028	OBSERVE	SES POWER STATUS	NOT USED
029	OBSERVE	SES POWER STATUS	OFF
030	OBSERVE	SES PWR CNTR SIG ST	ENABLE ON
031	OBSERVE	SES PWR CNTRL SIG ST	OFF
032	OBSERVE	SES PWR CNTRL SIG ST	NOT USED
033	OBSERVE		

Exhibit H. TCD-B Formatted Functional Data Perm File

IND UNIT	DISP/CONT/IND	PI/PS/ST	ITEM	ACTION	PARAMETER/FUNCTION	RAMP/INIT	REFERENCE
026	SCP MASS MEMORY READY	YELLOW		UNSENV	UNIT LO STATUS	PWR ON & HMI READY	
027	SCP SFS POWER APPLIED	ORNG		ORSENV	SFS POWER STATUS	ENABLED	
028	SCP SFS POWER APPLIED	YELLOW		ORSENV	SFS POWER STATUS	NOT USED	
029	SCP SFS POWER APPLIED	DATA		ORSENV	SFS POWER STATUS	OFF	
030	SCP SES ON	UNIT		UNSENV	SFS PWR CTRL SIG ST	ENABLED ON	
031	SCP SES ON	DATA		UNSENV	SFS PWR CTRL SIG ST	OFF	
032	SCP SES OFF	UNIT		ORSENV	SFS PWR CTRL SIG ST	NOT USED	
033	SCP SES OFF	DATA		ORSENV	SFS PWR CTRL SIG ST	NO SIGNIFICANCE	
034	SCP SES UN/SES OFF			TURN ON/OFF	SFS PWR CTRL SIG	SIGNAL ENABLED/OFF	
035	SCP COOLANT FLOW	DATA		ORSENV	COOLANT FLOW RATE	NO FUNCTION	
036	SCP COOLANT FLOW	ORNG		ORSENV	COOLANT FLOW RATE	NORMAL	
037	SCP COOLANT FLOW	RED		ORSENV	COOLANT FLOW RATE	ALLUM NORMAL	
038	SCP ALARM CANCEL	UNIT		ORSENV	ALARM RESET	NO SIGNIFICANCE	
039	SCP ALARM CANCEL	DATA		ORSENV	ALARM RESET	NO SIGNIFICANCE	
040	SCP ALARM CANCEL			TURN OFF	ALARM RESET	RESETS AUTO ALARM	
041	SCP APS POWER APPLIED	ORNG		ORSENV	APS POWER ST	ENABLED	
042	SCP APS POWER APPLIED	YELLOW		ORSENV	APS POWER STATUS	OFF	
043	SCP APS POWER APPLIED	DATA		ORSENV	APS POWER STATUS	SFS PWR CTRL SIG ON	
044	SCP APS ON	UNIT		ORSENV	APS PWR CTRL SIG ST	ENABLED ON	
045	SCP APS ON	DATA		ORSENV	APS PWR CTRL SIG ST	OFF	
046	SCP APS OFF	UNIT		ORSENV	APS PWR CTRL SIG ST	NOT A SES POWER ON	
047	SCP APS OFF	DATA		ORSENV	APS PWR CTRL SIG ST	ENABLED 11 ON UNITE	
048	SCP APS UN/APS OFF			TURN ON/OFF	APS PWR CTRL SIG	ENABLED/OFF	
049	SCP CABINET OVERTEMP	ORNG		ORSENV	SFS LAB TEMP LMTS	NORMAL	
050	SCP CABINET OVERTEMP	RED		ORSENV	SFS LAB TEMP LMTS	OVERTEMP	

Exhibit I. Unsorted Control and Display Table

